PART E

RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

1. Purpose.

A. The requirements in this Part establish radiation safety requirements and licensing and registration procedures for using sources of radiation for industrial radiography and for certification of industrial radiographers.

B. The requirements in this Part apply to licensees and registrants who possess sources of radiation for industrial radiography, including radiation machines, accelerators, and sealed radioactive sources.

C. Each licensee and registrant is responsible for ensuring compliance with this Part, license and registration conditions, and orders of the Agency.

D. Each licensee and registrant is also responsible for ensuring that radiographic personnel performing activities under a license or registration comply with this Part, license and registration conditions, and orders of the Agency.

2. Scope. The regulations in this Part apply to all licensees or registrants who use sources of radiation for industrial radiography. Except for those regulations clearly applicable only to sealed radioactive sources, both radiation machines and sealed radioactive sources are covered by this Part.

3. Definitions.

A. As used in this Part, the following definitions apply:

(1) "**Additional authorized use/storage site**" – see Field Station

(2) **"ANSI"** - American National Standards Institute.

(3) "**Annual refresher safety training**" means a review conducted or provided by the licensee for its employees on radiation safety aspects of industrial radiography. The review may include, as appropriate, the results of internal inspections, new procedures or equipment, new or revised regulations, accidents or errors that have been observed, and should also provide opportunities for employees to ask safety questions.

(4) "**Associated equipment**" means equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes in contact with the source, (e.g. guide tube, control tube, control (drive) cable, removable source stop, "J" tube and collimator when it is used as an exposure head).

(5) "**Cabinet x-ray system**"- An x-ray system with the x-ray tube installed in an enclosure independent of existing architectural structures except the floor on which it may be placed. An x-ray tube used within a shielded part of a building, or x-ray equipment that may temporarily or occasionally incorporate portable shielding, is not considered a cabinet x-ray system. The cabinet x-ray system is intended to:

(a) Contain at least that portion of a material being irradiated;

(b) Provide radiation attenuation; and.

(c) Exclude personnel from its interior during generation of radiation.

(6) "**Certifiable cabinet x-ray system**" - An existing uncertified x-ray system that has been modified to meet the certification requirements specified in 21 Code of Federal Regulations.

(7) "**Certification identification (ID) card**" - The document issued by the Agency to individuals who have completed the requirements stated in E.16.B.

(8) "**Certified cabinet x-ray system**" - An x-ray system that has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled on or after April 10, 1975, according to the provisions of 21 CFR 1020.40.

(9) "**Certifying entity**" means an independent certifying organization whose certification program has been reviewed and found to meet the requirements in Appendix A of 10 CFR Part 34 for radioactive materials and/or equivalent requirements for x-ray, or an Agreement State meeting the same requirements.

(10) "**Collimator**" means a radiation shield that is placed on the end of the guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

(11) "**Control (drive) cable**" means the cable that is connected to the source assembly and used to drive the source to and from the exposure location to return it to the shielded position..

(12) "**Control drive mechanism**" – see Crank out device.

(13) "**Control tube**" means a protective sheath for guiding the control cable. The control tube connects the control drive mechanism to the radiographic exposure device.

(14) "**Crank-out device**" - The drive cable, control tube, and drive mechanism used to move the sealed source to and from the shielded position to make an industrial radiographic exposure.

(15) "**Enclosed radiography**" - Industrial radiography conducted in an enclosed cabinet or room. Enclosed radiography includes shielded-room radiography.

(16) "**Exposure head**" means a device that locates the gamma radiography sealed source in the selected working position. (An exposure head is also known as a source stop.)

(17) "**Field station**" means a facility where licensed material may be stored or used and from which equipment is dispatched. This also includes an additional authorized use/storage site, which refers to those authorized use/storage locations specifically named on a license or certificate of registration other than the main site specified on a license or certificate of registration or other than temporary job sites .

(18) "**Fluoroscopic imaging assembly**" - A subsystem in which x-ray photons produce a fluoroscopic image. It includes the image receptors such as the image intensifier and spot-film device, electrical interlocks, if any, and structural material providing linkage between the image receptor and source assembly.

(19) "**GED**" - General educational development.

(20) **"Guide tube *(Projection sheath)"*** means a flexible or rigid tube (e.g. "J" tube) for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.

(21) "**Hands on experience**" means experience in all of those areas considered to be directly involved in the radiography process. This is also known as on-the-job training. The hours of on-the-job training do not include safety meetings, classroom training, travel, darkroom activities, film development and interpretation, or use of a cabinet x-ray unit.

(22) "**Independent certifying organization**" means an independent organization that meets all of the criteria of Appendix A of 10 CFR Part 34 for radioactive materials, or comparable standards for x-ray.

(23) "**Industrial radiography**" means an examination of the structure of materials by nondestructive methods, utilizing ionizing radiation to produce radiographic images.

(24) "**Lay-barge radiography**" means industrial radiography performed on any water vessel used for laying pipe.

(25) **"Lock-out survey"** - A radiation survey performed to determine that a sealed source is in its fully shielded position before moving the radiographic exposure device or source changer to a different temporary job site or before securing the radiographic exposure device or source changer against unauthorized removal.

(26) **"Offshore"** - Within the territorial waters of the state of Maine. The territorial waters of Maine extend to the three marine league line or nine nautical miles from the Maine coast.

(27) "**Permanent radiographic installation**" means an enclosed shielded room, cell, or vault, not located at a temporary jobsite, in which radiography is performed and meets the criteria of E.12.

(28) **"Permanent storage site"** - Any location that is specifically named on a license or certificate of registration and that is used only for storage of sources of radiation.

(29) "**Personal supervision**" means supervision in which the radiographer trainer is physically present at the site where sources of radiation, associated equipment, and survey meters are being used, watching the performance of the radiographer trainee and in such proximity that immediate assistance can be given if required.

(30) **"Pipeliners"** - A directional beam radiographic exposure device.

(31) **"Platform radiography"** - Industrial radiography performed on an offshore platform or other structure over a body of water.

(32) **"Practical examination"** means a demonstration through practical application of the safety rules and principles in industrial radiography including use of all appropriate equipment and procedures.

(33) **"Radiation safety officer (RSO)"** - An individual named by the licensee or registrant who has a knowledge of, responsibility for, and authority to enforce appropriate radiation protection rules, standards, and practices on behalf of the licensee or registrant and who meets the requirements of E.15.A. of this section.

(34) **"Radiographer"** - Any individual who has successfully completed the training, testing, and documentation requirements of E.16.B., and who is responsible to the licensee or registrant for assuring compliance with the requirements of the Agency's regulations and conditions of the license or certificate of registration. These individuals may be referred to as certified industrial radiographers or certified radiographers. The individual may also:

(a) perform industrial radiographic operations; or

(b) be in attendance at the site where the sources of radiation are being used.

(35) "**Radiographer certification**" means written approval received from a certifying entity stating that an individual has satisfactorily met certain established radiation safety, testing, and experience criteria.

(36) **"Radiographer trainee"** - Any individual who has successfully completed the training and documentation requirements of E.16.A. and who must use sources of radiation and related handling tools or radiation survey instruments under the personal supervision of a radiographer trainer.

(37) **"Radiographer trainer"** - A radiographer who instructs and supervises radiographer trainees during on-the-job training and who meets the requirements of E.16.C.

(38) "**Radiographic exposure device**" (also called a camera, or a projector) means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.

(39) **"Radiographic operations"** - All activities associated with the presence of x-ray machines or radioactive sources in a radiographic exposure device during the use of the machine or device or transport (except when being transported by a common or contract transport). Radiographic operations include surveys to confirm the adequacy of boundaries, setting up equipment, and any activity inside restricted area boundaries.

(40) **"Radiographic personnel"** - Any radiographer, radiographer trainer, or radiographer trainee.

(41) "**Residential location**" means any area where structures in which people lodge or live are located, and the grounds on which such structures are located including, but not limited to, houses, apartments, condominiums, and garages.

(42) **"S-tube**" means a tube through which the radioactive source travels when inside a radiographic exposure device.

(43) "**Sealed source**" means any byproduct material that is encased in a capsule designed to prevent leakage or escape of the byproduct material.

(44) "**Shielded position**" means the location within the radiographic exposure device or source changer where the sealed source is secured and restricted from movement.

(45) "**Shielded-room radiography**" means industrial radiography conducted in a room so shielded that radiation levels at every location on the exterior meet the limitations specified in Part D of these regulations. A shielded room is also known as a bay or bunker.

(46) "**Source assembly (pigtail)"** means an assembly that consists of the sealed source and a connector that attaches the source to the control cable. The source assembly may also include a stop ball used to secure the source in the shielded position.

(47) "**Source changer"** means a device designed and used for replacement of the sealed sources in radiographic exposure devices, including those also used for transporting and storage of sealed sources.

(48) "**Storage area**" means any location, facility, or vehicle which is used to store and secure a radiation machine, radiographic exposure device, a storage container, or a sealed source when it is not in use and which is locked or has a physical barrier to prevent accidental exposure, tampering with, or unauthorized removal of the machine, device, container, or source.

(49) "**Storage container**" means a device in which a sealed source is secured and stored.

(50) **"Storage facility"** - A structure designed to house one or more sources of radiation to provide security and shielding at a permanent storage site. A storage facility is also known as a vault.

(51) "**Temporary job site**" means a location where radiographic operations are conducted and where sources of radiation may be stored other than those location(s) of use authorized on the license or a certificate of registration.

(52) **"Trainee status card"** - The document issued by the Agency following completion of the requirements of E.16.A.

(53) "**Transport container**" means a package that is designed to provide radiation safety and security when sealed sources are transported and meets all applicable requirements of the U.S. Department of Transportation.

(54) "**Underwater radiography**" means industrial radiography performed when the radiographic exposure device and/or related equipment are beneath the surface of the water.

B. Exemptions.

(1) Uses of certified and certifiable cabinet x-ray systems are exempt from the requirements of this Part except for any applicable requirements of sections E.25. and E.30.

(2) Industrial uses of hand-held light intensified imaging devices are exempt from the requirements in this section if the exposure level 18 inches from the source of radiation to any individual does not exceed 2 millirem per hour (mrem/hr) (0.02 millisievert per hour (mSv/hr)). Devices with exposure levels that exceed the 2 mrem/hr (0.02 mSv/hr) level shall meet the applicable requirements of this section, Part D or Part H, as applicable.

(3) Radiation machines determined by the Agency to constitute a minimal threat to human health and safety in accordance with E.25. and E.30., as applicable, are exempt from the requirements in this section except for the requirements of paragraph 1 above.

(4) Facilities that utilize radiation machines for industrial radiography at permanent radiographic installations only are exempt from the requirements of this section except for the requirements of E.25. and E.30., as applicable.

C. Receipt, transfer, and disposal of sources of radiation and devices using depleted uranium (DU) for shielding. Each licensee and registrant shall make and maintain records in accordance with E.26, showing the receipt, transfer, and disposal of sources of radiation and devices using DU for shielding.

SPECIFIC LICENSING PROVISIONS

4. Application for a Specific License. A person may file an application for specific license for use of sealed sources in industrial radiography, on HHE Form 850I, "Application for Radioactive Material License for Industrial Radiography," in accordance with the provisions of this Part.

A. Specific license for industrial radiography. An application for a specific license for the use of licensed material in industrial radiography will be approved if the applicant meets the following requirements:

(1) The applicant satisfies the general requirements specified in Part C for byproduct material, as appropriate, and any special requirements contained in this Part.

(2) The applicant submits an adequate program for training radiographers and radiographer trainees that meets the requirements of E.16.

(a) A license applicant must demonstrate that all individuals acting as industrial radiographers will be certified in radiation safety by a certifying entity before commencing duty as radiographers.

(b) The applicant submits procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid.

(c) The applicant submits operating and emergency procedures as described in E.17.

(d) The applicant submits a description of a program for inspections of the job performance of each radiographer and radiographer trainee at intervals not to exceed 6 months as described E.16.G.

(e) The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility.

(f) The applicant identifies and lists the qualifications of the individual(s) designated as the RSO and potential designees responsible for ensuring that the licensee's radiation safety program is implemented in accordance with approved procedures.

(g) If an applicant intends to perform leak testing of sealed sources or exposure devices containing depleted uranium (DU) shielding, the applicant must describe the procedures for performing and the qualifications of the person(s) authorized to do the leak testing. If the applicant intends to analyze its own wipe samples, the application must include a description of the procedures to be followed. The description must include the:

(i) Instruments to be used;
(ii) Methods of performing the analysis; and
(iii) Pertinent experience of the person who will analyze the wipe samples.

(h) The applicant intends to perform "in-house" calibrations of survey instruments. The applicant must describe methods to be used and the relevant experience of the person(s) who will perform the calibrations. All calibrations must be performed according to the procedures describe and at the intervals prescribed in E.8.

(i) The applicant identifies and describes the location(s) of all field stations and permanent radiographic installations.

(j) The applicant identifies the locations where all records required by this Part will be maintained.

EQUIPMENT CONTROL

5. **Performance Requirements for Industrial Radiography Equipment.** Equipment used in industrial radiographic operations must meet the following minimum criteria:

A. Each radiographic exposure device, source assembly or sealed source, and all associated equipment must meet the requirements specified in American National Standard's Institute, N432-1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography" (published as NBS Handbook 136, issued January 1981). This publication has been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51.

(1) All newly manufactured radiographic exposure devices and associated equipment acquired by licensees after September 1, 1993, shall comply with the requirements of this section.

(2) All radiographic exposure devices and associated equipment in use after January 1, 1996, shall comply with the requirements of this section.

B. Engineering analysis may be submitted by a licensee to demonstrate the applicability of previously performed testing on similar individual radiography equipment components. Upon review, the Agency may find this an acceptable alternative to actual testing of the component pursuant to the above referenced standard.

C. In addition to the requirements specified in paragraphs E.5.A. and E.5.B. the following requirements apply to radiographic exposure devices, source changers, source assemblies and sealed sources.

(1) Radiographic exposure devices intended for use as Type B transport containers must meet the applicable requirements of 10 CFR Part 71 and Part L of these regulations.

(2) Modification of radiographic exposure devices, source changers, and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.

D. In addition to the requirements specified in paragraphs A., B., and C. of this section, the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for routine operations or to source changers.

(1) The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.

(2) The radiographic exposure device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device.

(3) The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device must be equipped with safety plugs or covers which must be installed to protect the source assembly from water, mud, sand or other foreign matter during storage and transportation.

(4) Each sealed source or source assembly must have attached to it or engraved in it a durable, legible, visible label with the words: "DANGER-RADIOACTIVE". The label must not interfere with the safe operation of the exposure device or associated equipment.

(5) Guide tubes must be able to withstand the crushing forces that closely approximate the crushing forces that are likely to be encountered during use, and be able to withstand the kinking resistance test that closely approximates the kinking likely to be encountered during use.

(6) Guide tubes must be used when moving the source out of the device.

(7) An exposure head or similar device designed to prevent the source assembly from passing out of the end of the guide tube must be attached to the outermost end of the guide tube during radiographic operations.

(8) The guide tube exposure head connection must be able to withstand the tensile test for control units specified in ANSI N432-1980.

(9) Source changers must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.

E. Notwithstanding paragraph A.(1) of this section, equipment used in industrial radiographic operations need not comply with 8.9.2(c) of the Endurance Test in American National Standards Institute N432-1980, if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment can realistically exert on the lever or crankshaft of the drive mechanism.

6. Limits on External Radiation Levels From Radiographic Exposure Devices, Storage Containers and Source Changers. The maximum exposure rate limits for radiographic exposure devices, storage containers and source changers are 2 millisieverts (200 millirem) per hour at any exterior surface, and 0.1 millisieverts (10 millirem) per hour at 1 meter from any exterior surface with the sealed source in the shielded position.

7. Locking of Radiographic Exposure Devices, Storage Containers and Source Changers.

A. Each radiographic exposure device must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device and/or its container must be kept locked at all times (and if a keyed-lock, with the key removed at all times) when not under the direct visual surveillance of a radiographer or radiographer's trainee except at permanent radiographic installations as stated in E.12. In addition, during radiographic operations the sealed source assembly must be secured in the shielded position each time the source is returned to that position.

B. Each sealed source storage container and source changer must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers must be kept locked (and if a keyed lock, with the key removed at all times) when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer's trainee.

C. Each radiographic exposure device, storage container, and source changer shall be locked and the key removed from any lock prior to being transported from one location and also prior to being stored at a given location.

D. Locking and permanent storage precautions.

(1) Radiographic exposure devices, source changers, and transport containers that contain sealed sources shall be secured while in storage to prevent tampering or removal by unauthorized individuals.

(2) Radiographic exposure devices, source changers, or transport containers that contain radioactive material may not be stored in residential locations. This section does not apply to storage of radioactive material in a vehicle in transit for use at temporary job sites, if the licensee complies with all applicable sections of this Part and if the vehicle does not constitute a permanent storage location as described in this Part.

8. Radiation Survey Instruments.

A. Each licensee and registrant shall keep a sufficient number of calibrated, appropriate, and operable radiation survey instruments at each location where sources of radiation and radiation machines are present to make the radiation surveys required by this Part and by Part D. Instrumentation required by this section must be capable of measuring a range from 0.02 millisieverts (2 millirems) per hour through 0.01 sievert (1 rem) per hour.

B. The licensee or registrant shall have each radiation survey instrument required under paragraph A of this section calibrated:

(1) At intervals not to exceed 6 months and after instrument servicing, except for battery changes;

(2) For linear scale instruments, at two points located approximately one-third and two-thirds of full scale; for logarithmic scale instruments, at mid-range of each decade, and at two points of at least one decade; and for digital instruments, at 3 points between 0.02 and 10 millisieverts (2 and 1000 millirems) per hour; and

(3) So that an accuracy within plus or minus 20 percent of the calibration source can be demonstrated at each point checked.

(4) By a person licensed or registered by the Agency, another agreement state, or the NRC to perform such service;

(5) At energies appropriate for the licensee's or registrant's use;

C. Each radiation survey instrument shall be checked with a radiation source at the beginning of each day of use and at the beginning of each work shift to ensure it is operating properly.

D. Each licensee and registrant shall maintain records of the results of the instrument calibrations in accordance with E.26.C.

9. Leak Testing and Replacement of Sealed Sources.

A. The replacement of any sealed source fastened to or contained in a radiographic exposure device, leak testing of any sealed source, and leak testing analyses shall be performed only by persons authorized to do so by the Agency, the NRC or another Agreement State.

B. The opening, repair or modification of any sealed source must be performed by persons specifically authorized to do so by the Agency, the NRC or an Agreement State.

C. Testing and recordkeeping requirements.

(1) Each licensee who uses a sealed source shall have the source tested for leakage at intervals not to exceed 6 months. The leak testing of the source must be performed using a method approved by the Agency, the NRC or by an Agreement State. The wipe sample should be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample must be analyzed for radioactive contamination. The analysis must be capable of detecting the presence of 185 Bq (0.005 microcurie) of radioactive material on the test sample and must be performed by a person specifically authorized by the Agency, the NRC, or an Agreement State to perform the analysis.

(2) The licensee shall maintain records of the leak tests in accordance with E.26.

(3) Unless a sealed source is accompanied by a certificate from the transferor, that shows that it has been leak tested within 6 months before the transfer, it may not be used by the licensee until tested for leakage. Sealed sources that are in storage and not in use do not require leak testing, but must be tested before use or transfer to another person if the interval of storage exceeds 6 months.

D. Any test conducted pursuant to paragraphs B and C of this section which, reveals the presence of 185 Bq (0.005 microcurie) or more of removable radioactive material must be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall have it to be decontaminated and repaired or disposed of, in accordance with Agency regulations. A report must be filed with the Agency – within 5 days of any test with results that exceed the threshold in this subsection, describing the equipment involved, the test results, and the corrective action taken.

E. Each exposure device using depleted uranium (DU) shielding and an "S" tube configuration must be tested for DU contamination at intervals not to exceed 12 months. The analysis must be capable of detecting the presence of 185 Bq (0.005 microcuries) of radioactive material on the test sample and must be performed by a person specifically authorized by the Agency, the NRC or an Agreement State to perform the analysis. Should such testing reveal the presence of DU contamination, the exposure device must be removed from use until an evaluation of the wear of the S-tube has been made. Should the evaluation reveal that the S-tube is worn through, the device shall not be used again. DU shielded devices do not have to be tested for DU contamination while in storage and not in use. Before using or transferring such a device however, the device must be tested for DU contamination, if the interval of storage exceeds 12 months. A record of the DU leak-test must be made in accordance with E.26. A report must be filed with the Agency – within 5 days of any test with results that exceed the threshold in this subsection, describing the equipment involved, the test results, and the corrective action taken.

10. Quarterly Inventory.

A. Each licensee and registrant shall conduct a physical inventory at intervals not to exceed three months, to account for all sources of radiation and for devices containing depleted uranium received and possessed under this license.

B. Each licensee and registrant shall maintain records of the inventory in accordance with E.26.

11. Inspection and Maintenance of Radiation Machines, Radiographic Exposure Devices, Transport and Storage Containers, Associated Equipment, Source Changers, and Survey Instruments.

A. Each radiographer shall perform visual and operational checks on radiation machines, survey meters, radiographic exposure devices, transport and storage containers, associated equipment and source changers before use on each day the equipment is to be used to ensure that the equipment is in good working condition, that the sources are adequately shielded, and that required labeling is present. Survey instrument operability must be performed using check sources or other appropriate means. If equipment problems are found, the equipment must be removed from service until repaired.

B. Each licensee and registrant shall have written procedures for:

(1) Inspection and routine maintenance of radiation machines, radiographic exposure devices, source changers, associated equipment, transport and storage containers, and survey instruments at intervals not to exceed 3 months or before the first use thereafter to ensure the proper functioning of components important to safety. Replacement components shall meet design specifications. If equipment problems are found, the equipment must be removed from service until repaired. All appropriate components shall be maintained in accordance with manufacturers' specifications. Radiation machines, radiographic exposure devices, transport containers and source changers being stored are exempted from this requirement provided that each radiation machine, radiographic exposure device, transport container, or source changer is inspected and repaired prior to being returned to service. This inspection and maintenance program shall cover, as a minimum, the items listed in Appendix B of this Part; and

(2) Inspection and maintenance necessary to maintain the Type B packaging used to transport radioactive materials. The inspection and maintenance program must include procedures to assure that Type B packages are shipped and maintained in accordance with the certificate of compliance or other approval.

C. Records of equipment problems and of any maintenance performed under paragraphs A and B of this section must be made in accordance with E.26.G.

12. Permanent Radiographic Installations.

A. Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation must have either:

(1) An entrance control of the type described in Part D.19.A.(1) that reduces the radiation level upon entry into the area, or

(2) Both conspicuous visible and audible warning signals to warn of the presence of radiation. The visible signal must be actuated by radiation whenever the source is exposed. The audible signal must be actuated, when an attempt is made to enter the installation while the source is exposed.

B. The alarm system must be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test must include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry (designated in paragraph A.(1). of this section) must be tested monthly. If an entrance control device or an alarm is operating improperly, it must be immediately labeled as defective and repaired within 7 calendar days. The facility may continue to be used during this 7-day period, provided the licensee implements the continuous surveillance requirements of E.21. and uses an alarming ratemeter. Test records for entrance controls and audible and visual alarm must be maintained in accordance with E.26.

13. Labeling, Storage, and Transportation.

A. The licensee may not use a source changer or a container to store licensed material unless the source changer or the storage container has securely attached to it a durable, legible, and clearly visible label bearing the standard trefoil radiation caution symbol conventional colors, i.e. magenta, purple or black on a yellow background, having a minimum diameter of 25 millimeters, and the wording

CAUTION*
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES
(or "NAME OF COMPANY")
*_____or "DANGER"

B. The licensee may not transport licensed material unless the material is packaged, and the package is labeled, marked, and accompanied with appropriate shipping papers in accordance with regulations set out in Part L and 10 CFR Part 71.

C. Locked radiographic exposure devices, source changers, and storage containers must be physically secured to prevent tampering or removal by unauthorized personnel. The licensee shall store licensed material in a manner that will minimize danger from explosion or fire.

D. The licensee shall lock and physically secure the transport package containing licensed radioactive material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the licensed material from the vehicle.

E. The licensee's name and city or town where the main business office is located shall be prominently displayed with a durable, clearly visible label(s) on both sides of all vehicles used to transport radioactive material for temporary job site use.

F. The licensee shall ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing the:

(a) Chemical symbol and mass number of the radionuclide in the device;
(b) Activity and the date on which this activity was last measured;
(c) Model (or product code) and serial number of the sealed source;
(d) Manufacturer's identity of the sealed source; and
(e) Licensee's name, address, and telephone number.

Radiation Safety

14. Conducting Industrial Radiographic Operations.

A. Whenever radiography is performed at a location other than a permanent radiographic installation, the qualified radiographer must be accompanied by at least one other qualified radiographer, qualified radiographer trainer, or qualified radiographer trainee. This additional qualified individual shall observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.

B. All radiographic operations conducted at locations of use authorized on the license must be conducted in a permanent radiographic installation, unless specifically authorized by the Agency.

C. A licensee may conduct lay-barge, offshore platform, or underwater radiography only if procedures have been approved by the Agency.

D. Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer must notify the requesting person's radiation safety officer or the person responsible for safety matters for those that do not have a radiation safety officer, before taking any licensed material onto the location.

15. Radiation Safety Officer for Industrial Radiography. The RSO shall ensure that radiation safety activities are being performed in accordance with approved procedures and requirements in the daily operation of the licensee's or registrant's program.

A. The minimum qualifications, training, and experience for RSO's for industrial radiography are as follows:

1. Possession of a high school diploma or a certificate of high school equivalency based on the GED test.

2. Completion of the training and testing requirements of E.16.;

3. Two years of documented experience including knowledge of industrial radiographic operations; and

4. Formal training in the establishment and maintenance of a radiation protection program.

B. The Agency will consider alternatives when the RSO has appropriate training and/or experience in the field of ionizing radiation, and in addition, has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program..

C. The specific duties and authorities of the RSO include, but are not limited to:

(1) Establishing and overseeing all operating, emergency, and ALARA procedures as required by Part D, and reviewing them regularly to ensure that the procedures in use conform to current Part D procedures, conform to other Agency regulations (Parts A, E, & J) and to the license conditions or certificate of registration.

(2) Overseeing and approving all phases of the training program for radiographic personnel, ensuring that appropriate and effective radiation protection practices are taught;

(3) Ensuring that required radiation surveys and leak tests are performed and documented in accordance with the regulations, including any corrective measures when levels of radiation exceed established limits;

(4) Ensuring that personnel monitoring devices are calibrated and used properly by occupationally exposed personnel, that records are kept of the monitoring results, and that timely notifications are made as required by Part D.56.; and

(5) Ensuring that operations are conducted safely an to assume control for instituting corrective actions including stopping of operations when necessary.

(6) Ensuring that any required interlock switches and warning signals are functioning and that radiation signs, ropes, and barriers are properly posted and positioned;

(7) Investigating, determining the cause, taking steps to prevent the recurrence, and reporting to the Agency each:

(a) known or suspected case of radiation exposure to an individual or radiation level detected in excess of limits established by this Part; and

(b) theft or loss of a source(s) of radiation.

16. Requirements for qualifications of radiographic personnel.

A. Radiographer trainee. No licensee or registrant shall permit any individual to act as a radiographer trainee until the individual possesses the original or a copy of an Agency-issued trainee status card or certification ID card.

(1) To obtain an Agency-issued trainee status card, the licensee, registrant, or the individual must document to the Agency on Form HHE-851 or equivalent that such individual has successfully completed a course of at least 40 hours on the applicable subjects outlined in E.Appendix A. The course must be one accepted by the Agency, another agreement state, or the NRC.

(2) The trainee must carry a copy of the completed HHE-851 listed above, in the interim period after submitting documentation to the Agency and before receiving a trainee status card. The copy of the completed HHE-851 that was submitted to the Agency may be used in lieu of the trainee status card for a period of 60 days from the date recorded by the trainee on the documentation.

(3) The individual shall notify the Agency by telephone, telegram, telefacsimile, electronic media transmission, or in writing of the need for a replacement trainee status card. The individual shall carry a copy of documentation of the request while performing industrial radiographic operations until a replacement trainee status card is received from the Agency.

B. Radiographer. No licensee or registrant shall permit any individual to act as a radiographer until the individual carries a valid radiographer certification. To obtain a radiographer certification, an individual must comply with the following:

(1) The licensee, registrant, or the individual must document to the Agency on Forms HHE-854 and HHE-856 or equivalent that such individual:

(a) has completed the requirements of E.16.A.(1);

(b) has completed 2 months on-the-job training as a radiographer trainee supervised by one or more radiographer trainers authorized on a license or certificate of registration;

(i) The radiographer trainee must carry a legible trainee status card in accordance with paragraph A of this section while obtaining the on-the-job training specified in (1)(b)(ii)-(vii) of this section.

(ii) The 2 months on-the-job training shall include at least 320 hours of active participation in radioactive materials industrial radiographic operations or 1 month, 160 hours, for active participation in x-ray industrial radiographic operations.

(iii) Individuals performing industrial radiography utilizing radioactive materials and x-ray machines must complete both segments 3 months (480 hours) of on-the-job training.

(iv) The hours of on-the-job training do not include safety meetings, classroom training, travel, darkroom activities, film development and interpretation, or use of a cabinet x-ray unit.

(v) One year of documented experience or on-the-job training as authorized by another agreement state or the NRC may be substituted for (1)(b)(ii) or (iii) of this section. The documentation must be submitted to the Agency on Form HHE-856 or equivalent.

(vi) The trainee shall be under the personal supervision of a radiographer trainer whenever a radiographer trainee:

(a) Uses radiation machines, radiographic exposure devices, or associated equipment; or

(b) Performs radiation surveys required by E.19. to determine that the sealed source has returned to the shielded position after an exposure or the radiation machine has stopped producing radiation.

(vii) The personal supervision shall include the following.

(a) The radiographer trainer's physical presence at the site where the sources of radiation are being used;

(b) The availability of the radiographer trainer to give immediate assistance if required; and

(c) The radiographer trainer's direct observation of the trainee's performance of the operations referred to in this section.

(2) Has successfully completed within the last five years the appropriate Agency-administered examination prescribed in E.33 or the appropriate examination of another certifying entity that affords the same or comparable certification standards as those afforded by (1) and (3) of this section and E.33.; and

(3) Possesses a current certification ID card issued in accordance with E.33 or by another certifying entity that affords the same or comparable certification standards as those afforded by (1) and (2) of this Part and E.33.

(4) Reciprocal recognition by the Agency of an individual radiographer certification may be granted according to E.24:

(5) Once an individual has completed the requirements of paragraph 3 of this section, the licensee or registrant is not required to submit the documentation referenced in paragraph B.(1)(a) and (b) of this section.

C. Radiographer trainer.

(1) No licensee or registrant shall permit any individual to act as a radiographer trainer until:

(a) it has been documented to the Agency on Form HHE-851 or equivalent that such individual has:

(i) Met the radiographer certification requirements of E.16.B.; and
(ii) One year of documented experience as a certified radiographer.

(b) determination is made by the Agency that the individual is not currently under order from the Agency prohibiting the individual from acting as a radiographer trainer.

(2) The specific duties of the radiographer trainer include, but are not limited to, the following:

(a) providing personal supervision to any radiographer trainee at the site where the sources of radiation are being used; and

(b) preventing any unauthorized use of a source of radiation by a radiographer trainee.

D. In addition, the licensee or registrant may not permit any individual to act as a radiographer, radiographer trainee, radiographer trainer, or RSO until the individual has:

(1) Received copies of and demonstrated an understanding of the following by successful completion of a written or oral examination administered by the licensee or registrant covering this material:

(a) the requirements contained in this Part and the applicable requirements of Parts A, B, C, D, F, H, J, and L;
(b) the appropriate conditions of the license(s) and certificate(s) of registration;

(c) the licensee's or registrant's operating and emergency procedures; and

(2) Demonstrated competence in the use of sources of radiation, radiographic exposure devices, associated equipment, related handling tools, and radiation survey instruments, that may be employed in industrial radiographic assignments by successful completion of a practical examination administered by the licensee or registrant covering such use.

E. Records of the administration of and the examinations required by D.1. of this section shall be made and maintained for Agency inspection in accordance with E.26.

F. The licensee or registrant shall provide annual refresher safety training for each radiographer and radiographer's trainee at intervals not to exceed 12 months.

G. Except as provided in paragraph .D., the RSO or designee shall conduct an internal audit of the job performance of each radiographer and radiographer's trainee to ensure that the Agency's regulations, license or certificate of registration requirements, and the licensee's or registrants operating and emergency procedures are followed. The audit program must:

(1) Include observation of the performance of each radiographer and radiographer's trainee during an actual industrial radiographic operation, at intervals not to exceed 6 months; and

(2) Provide that, if a radiographer or a radiographer's trainee has not participated in an industrial radiographic operation during the 6 months since the last inspection, the radiographer or radiographer trainee must demonstrate knowledge of the training requirements of E.16.D. by a practical examination, administered by the licensee or registrant, before these individuals can next participate in a radiographic operation.

(3) The Agency may consider alternatives in those situations where the individual serves as both radiographer and RSO.

(4) In those operations where a single individual serves as both radiographer and RSO, and performs all radiography operations, an inspection program is not required.

H. The licensee or registrant shall maintain records of the above training to include certification documents, written and practical examinations, refresher safety training and audits of job performance in accordance with E.26.

I. The licensee or registrant training shall include the subjects covered in Appendix A of this Part.

17. Operating and Emergency Procedures

A. Operating and emergency procedures must include, as a minimum, instructions as outlined in E.Appendix C.

18. Personnel Monitoring

A. The licensee or registrant may not permit any individual to act as a radiographer or a radiographer trainer, or radiographer trainee unless, at all times during radiographic operations, each individual wears, on the trunk of the body, a combination of direct reading dosimeter or an electronic personal dosimeter, an operating alarm ratemeter, and an individual monitoring device that meets the requirements of Part D.17. At permanent radiography installations where other appropriate alarming or warning devices are in routine use, the wearing of an alarming ratemeter is not required.

(1) Pocket dosimeters must have a range from zero to 2 millisieverts (200 milliroentgens) and must be recharged at the start of each work shift. Electronic personal dosimeters may only be used in place of ion-chamber pocket dosimeters.

(2) Each approved individual monitoring device must be assigned to and worn by only one individual.

(3) Individual monitoring devices must be replaced at least monthly. After replacement, each individual monitoring device must be returned to the supplier for processing as soon as possible or within 14 calendar days of the exchange date specified by the personnel monitoring supplier or as soon as practicable. In circumstances that make it impossible to return each individual monitoring device within 14 calendar days, such circumstances must be documented and available for review by the Agency. If an individual monitoring device is lost or damaged, the worker shall cease work immediately until a replacement individual monitoring device is provided and the exposure is calculated for the time period from issuance to loss or damage of the individual monitoring device. The results of the calculated exposure and the time period for which the individual monitoring device was lost or damaged shall be included in the records maintained in accordance with E.26. of this Part.

B. Direct reading dosimeters such as pocket dosimeters or electronic personal dosimeters, must be read and the exposures recorded at the beginning and end of each work shift (or day), and the accumulated doses for that day determined and recorded. The records must be maintained in accordance with E.26.

C. Pocket dosimeters, or electronic personal dosimeters, must be checked at periods not to exceed 12 months for correct response to radiation, and records must be maintained in accordance with E.26. Acceptable dosimeters must read within plus or minus 20 percent of the true radiation exposure.

D. If an individual's pocket dosimeter is found to be off-scale, or if an individual's electronic personal dosimeter reads greater than 2 millisieverts (200 milliroentgens), and the possibility of radiation exposure cannot be ruled out as the cause, the individual's personal monitoring device must be sent for processing within 24 hours. In addition, the individual may not resume work associated with the use of sources of radiation until a determination of the individual's radiation exposure has been made. This determination must be made by the RSO or the RSO's designee. The results of this determination must be included in the records maintained in accordance with E.26.

E. If an individual monitoring device is lost or damaged, the worker shall cease work immediately until a replacement individual monitoring device is provided and the exposure is calculated for the time period from issuance to loss or damage of the individual monitoring device. The results of the calculated exposure and the time period for which the individual monitoring device was lost or damaged must be included in the records maintained in accordance with E.26.

F. Reports received from the individual monitoring device processor must be retained in accordance with E.26.

G. Each alarm ratemeter must -

(1) Be checked to ensure that the alarm functions properly (sounds) before using at the start of each work shift;

(2) Be set to give an alarm signal at a preset dose rate of 5 mSv/hr (500 mrem/hr) or lower; with an accuracy of plus or minus 20 percent of the true radiation dose rate;

(3) Require special means to change the preset alarm function; and

(4) Be calibrated at periods not to exceed 12 months for correct response to radiation. The licensee or registrant shall maintain records of alarm ratemeter calibrations in accordance with E.26.

19. Radiation Surveys. The licensee shall:

A. No radiographic operation shall be conducted unless calibrated and operable radiation survey instrumentation as described in E.8. is available and used at each site where radiographic exposures are made

B. Using a survey instrument meeting the requirements of E.8.A.-C. of this Part, conduct a physical survey of the entire circumference of the radiographic exposure device and the guide tube after each exposure when approaching the device or the guide tube. The survey must determine that the sealed source has returned to its shielded position before exchanging films, repositioning the exposure head, or dismantling equipment.

C. Conduct a survey of the radiographic exposure device with a calibrated radiation survey instrument any time the source is exchanged and whenever a radiographic exposure device is placed in a storage area (as defined in E.3.) to ensure that the sealed source is in its shielded position.

D. All potential radiation areas where industrial radiographic operations are to be performed shall be posted in accordance with E.22., based on estimated dose rates, before industrial radiographic operations begin. An area survey shall be performed during the first radiographic exposure to confirm that E.22. requirements have been met and that unrestricted areas do not have radiation levels in excess of the limits specified in Part D.

E. Each time re-establishment of the restricted area is required, the requirements of paragraph D. of this section shall be met.

F. The requirements of E.19.E. do not apply to pipeline industrial radiographic operations when the conditions of exposure including, but not limited to, the radiographic exposure device, duration of exposure, source strength, pipe size, and pipe thickness remain constant.

G. A lock-out survey, in which all accessible surfaces of the radiographic exposure device or source changer are surveyed, shall be performed.

H. Surveys shall be performed on storage containers to ensure that the source is shielded and the radiation levels do not exceed the limits specified in Part D. These surveys shall be performed initially with the maximum amount of radioactive material present in the storage location and thereafter at the time of the quarterly inventory and whenever storage conditions change.

I. A survey meeting the requirements of E.19.B. shall be performed on the radiographic exposure device and the source changer after every sealed source exchange.

J. Records of the surveys required by E.19. shall be made and maintained in accordance with E.26.

20. Requirements for Underwater, Offshore Platform, and Lay-Barge Radiography

A. Underwater, offshore platform, and/or lay-barge radiography shall not be performed unless specifically authorized in a license issued by the Agency in accordance with E.4. of this Part.

B. In addition to the other requirements of this section, the following requirements apply to the performance of offshore platform or lay-barge radiography.

1. Cobalt-60 sources with activities in excess of 20 curies (nominal) and iridium-192 sources with activities in excess of 100 curies (nominal) shall not be used in the performance of offshore platform or lay-barge radiography.
2. Collimators shall be used for all industrial radiographic operations performed on offshore platforms or lay-barges.

21. Surveillance.

A. During each radiographic operation the radiographic personnel, shall maintain continuous direct visual surveillance of the operation to protect against unauthorized entry into a high radiation area, as defined in Part A.2.A, except at permanent radiographic installations where all entryways are locked and the requirements of E.12. are met.

B. Radiographic exposure devices shall not be left unattended except when in storage or physically secured against unauthorized removal or tampering.

22. Posting.

A. All areas in which industrial radiography is being performed must be conspicuously posted as required by D.28. Exceptions listed in D.29. do not apply to industrial radiographic operations.

B. Whenever practicable, ropes and/or barriers shall be used in addition to appropriate signs to designate areas in accordance with Part D.28. and to help prevent unauthorized entry.

C During pipeline industrial radiographic operations, sufficient radiation signs and other barriers shall be posted to prevent unmonitored individuals from entering the area in accordance with Part D.28.

D. In lieu of the requirements of E.22.A., a restricted area may be established in accordance with Part D and be posted in accordance with E.22.A., for example, both signs may be posted at the same location at the boundary of the restricted area.

23. Utilization logs.

A. Each licensee and registrant shall make and maintain current logs of the use, removal, and return to storage of each source of radiation. The information shall be recorded in the log when the source is removed from and returned to storage. The logs shall include:

(1) A description, including the make, model and serial number, of the following:

(a) Each radiation machine;
(b) Each radiographic exposure device containing a sealed source or transport and storage container in which the sealed source is located; and
(c) Each sealed source;

(2) The name and signature of the radiographer using the source of radiation;

(3) The location(s) and date(s) where each source of radiation is used; and

(4) The date(s) each source of radiation is removed from storage and returned to storage.

B. Utilization logs shall be kept on clear, legible records containing all the information required by paragraph A. above.

C. Records of utilization logs shall be made and maintained for Agency inspection in accordance with E.26. These must be retained as specified in E.26.F.

24. Reciprocity.

A. All reciprocal recognition of licenses or certificates of registration by the Agency will be granted in accordance with Parts C & E of these regulations.

B. Reciprocal recognition by the Agency of an individual radiographer certification will be granted provided that:

1. The individual holds a valid certification in the appropriate category and class issued by a certifying entity, as defined in this Part;

2. The requirements and procedures of the certifying entity issuing the certification afford the same or comparable certification standards as those afforded by this Part; and

3. The individual submits a legible copy of the certification to the Agency prior to entry into Maine.

C. Enforcement actions with the Agency, another agreement state, or the NRC or sanctions by an independent certifying entity may be considered when reviewing a request for reciprocal recognition from a licensee, registrant, or certified radiographer.

D. Certified radiographers who are granted reciprocity by the Agency shall maintain the certification upon which the reciprocal recognition was granted, or prior to the expiration of such certification, shall meet the requirements of this Part.

25. Radiation safety requirements for the use of radiation machines.

A. Locking of radiation machines. The control panel of each radiation machine shall be equipped with a locking device that will prevent the unauthorized use of an x-ray system or the accidental production of radiation. The radiation machine shall be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer.

B. Permanent storage precautions for the use of radiation machines. Radiation machines shall be secured, while in storage to prevent tampering or removal by unauthorized individuals.

C. Requirements for radiation machines used in industrial radiographic operations.

(1) Equipment used in industrial radiographic operations involving radiation machines manufactured after October 1, 1987, shall be certified at the time of manufacture to meet the criteria set forth by ANSI N537-1976, except accelerators used in industrial radiography.

(2) The registrant's name and city or town where the main business office is located shall be prominently displayed with a durable, legible, clearly visible label(s) on both sides of all vehicles used to transport radiation machines for temporary job site use.

D. Operating and internal audit requirements for the use of radiation machines.

(1) Each registrant shall conduct an internal audit program to ensure that the requirements of this Part, the conditions of the certificate of registration, and the registrant's operating and emergency procedures are followed by radiographic personnel.

(2) Each radiographer's and radiographer trainee's performance during an actual radiographic operation shall be audited and documented at intervals not to exceed six months.

(3) If a radiographer or a radiographer trainee has not participated in a radiographic operation during the six months since the last audit, the radiographer or the radiographer trainee shall demonstrate knowledge of the training requirements of this Part by an oral or written and practical examination administered by the registrant before the individual can next participate in a radiographic operation.

(4). The Agency may consider alternatives in those situations where the individual serves as both radiographer and RSO.

(5) In those operations where a single individual serves as both radiographer and RSO and performs all radiography operations, an audit program is not required.

(6) No individual, other than a radiographer or a radiographer trainee, who is under the personal supervision of a radiographer trainer, shall manipulate controls or operate radiation machines used in industrial radiographic operations. Only one radiographer is required to operate radiation machines during industrial radiography.

(7) Radiographic operations shall not be conducted at storage sites unless specifically authorized by the certificate of registration.

(8). Records of audits specified in this subsection shall be made and maintained in accordance with E.26.

(9) Records of the annual refresher training required by E.16. shall be made and maintained in accordance with E.26.

E. Radiation surveys for the use of radiation machines.

(1) No industrial radiographic operation shall be conducted unless at least one calibrated and operable radiation survey instrument, as described in E.8., is used for each radiation machine energized.

(2) A physical radiation survey shall be made after each radiographic exposure using radiation machines to determine that the machine is "off."

(3) All potential radiation areas where industrial radiographic operations are to be performed shall be posted in accordance with E.22., based on estimated dose rates, before industrial radiographic operations begin. An area survey shall be performed during the first radiographic exposure to confirm that E.22. requirements have been met and that unrestricted areas do not have radiation levels in excess of the limits specified in Part D.

(4) Records of the surveys required by E.25. shall be made and maintained in accordance with E.26.

F. Requirements for radiation machines in enclosed radiography.

(1) Systems for enclosed radiography, including shielded-room radiography and cabinet x-ray systems not otherwise exempted, shall comply with all applicable requirements of this section.

(2) Systems for enclosed radiography designed to allow admittance of individuals and systems not otherwise exempted shall be evaluated at intervals not to exceed one year to ensure compliance with the applicable requirements of this Part and Part H as applicable.

(3) Certified and certifiable cabinet x-ray systems, including those designed to allow admittance of individuals, are exempt from the requirements of this section except that:

(a) No registrant shall permit any individual to operate a cabinet x-ray system until the individual has received a copy of and instruction in the operating procedures for the unit.

(b) Tests for proper operation of interlocks must be conducted and recorded at intervals not to exceed 12 months.

(c) The registrant shall perform an evaluation to determine compliance with Parts E and H (as applicable) and 21 CFR 1020.40 at intervals not to exceed one year.

(4) Certified cabinet x-ray systems shall be maintained in compliance with 21 CFR 1020.40 and no modification shall be made to the system unless prior Agency approval has been granted.

(5) Records required by this subsection shall be made and maintained in accordance with E.26.

G. Registration requirements for industrial radiographic operations.

(1) Radiation machines used in industrial radiographic operations shall be registered in accordance with Parts F and/or H, as applicable.

(2) In addition to the registration requirements in Parts F and/or H, an application for a certificate of registration shall include the following information:

(a) A schedule or description of the program for training radiographic personnel that specifies:

(i) Initial training;

(ii) Annual refresher training;

(iii) On-the-job training;

(iv) Procedures for administering the oral and written examination to determine the knowledge, understanding, and ability of radiographic personnel to comply with the requirements of this Part, the conditions of the certificate of registration, and the registrant's operating and emergency procedures; and

(v) Procedures for administering the practical examination to demonstrate competence in the use of sources of radiation, and radiation survey instruments that may be employed in industrial radiographic assignments.

b. Written operating and emergency procedures, including all items listed in E.17.;

c. A description of the internal audit program to ensure that radiographic personnel follow the requirements of this Part, the conditions of the certificate of registration, and the registrant's operating and emergency procedures at intervals not to exceed six months;

d. A list of permanent radiographic installations, descriptions of permanent storage use sites, and the location(s) where all records required by this Part will be maintained. Radiographic equipment shall not be stored or used at a permanent site unless such site is specifically authorized by the certificate of registration. A storage site is permanent if radiation machines are stored at that location and if one or more of the following applies:

(i) The registrant establishes telephone service that is used for contracting or providing industrial radiographic services for the registrant;

(ii) Industrial radiographic services are advertised for or from the site;

(iii) Radiation machines stored at that location are used for industrial radiographic operations conducted at other sites; or

(iv) Any registrant conducting radiographic operations or storing radiation machines at any location not listed on the certificate of registration for a period in excess of 90 days in a calendar year shall notify the Agency prior to exceeding the 90 days.

(v) A description of the organization of the industrial radiographic program, including delegations of authority and responsibility for operation of the radiation safety program; and

(vi) Procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid.

(3) A certificate of registration will be issued if the requirements of this subsection and all applicable sections of Parts F and/or H are met

RECORD KEEPING

26. Record keeping Requirements

A Records of the specific license for industrial radiography. Each licensee shall maintain a copy of its license, license conditions, documents incorporated by reference, and amendments to each of these items until superseded by new documents approved by the Agency, or until the Agency terminates the license.

B. Records of receipt, transfer, and disposal of sources of radiation and/or devices using DU for shielding.

(1) Each licensee and registrant shall maintain records showing the receipts, transfers, and disposal of sources of radiation and devices using DU for shielding and retain each record for 3 years after it is made.

(2) The records must include the date of receipt, transfer, or disposal, the name of the individual making the record, radionuclide, number of becquerels (curies) or mass (for DU); and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

C. Records of radiation survey instruments. Each licensee and registrant shall maintain records of the calibrations of its radiation survey instruments that are required under E.8. and retain each record for 3 years after the calibration date.

D. Records of leak testing of sealed sources and devices containing DU. Each license shall maintain records of leak test results for sealed sources and for devices containing DU. The results must be stated in units of becquerels (microcuries). The licensee shall retain each record for 3 years after it is made or until the source in storage is removed.

E. Records of quarterly inventory.

(1) Each licensee and registrant shall maintain records of the quarterly inventory of sources of radiation and of devices containing depleted uranium required by E.10. and retain each record for 3 years after the date of the inventory.

(2) The record must include the date of the inventory, name of the individual making the inventory record, radionuclide, number of becquerels (curies) or mass (for DU) in each in device, location of source of radiation, and manufacturer, model and serial number of each source of radiation, as appropriate.

F. Utilization logs.

(1) Each licensee and registrant shall maintain the logs required by E.23. for 3 years after the utilization log is made.

G. Records of inspection and maintenance of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments.

(1) Each licensee and registrant shall maintain records specified in E.11 of equipment problems found in daily checks and quarterly inspections of radiographic exposure devices, transport and storage containers, associated equipment, source changers, survey instruments, and radiation machines; and retain each record for 3 years after it is made.

(2) The record must include the date of check or inspection, name of inspector, equipment involved, any problems found, and what repair and/or maintenance, if any, was done.

H. Records of alarm system and entrance control tests at permanent radiographic installations. Each licensee and registrant shall maintain records of alarm system and entrance control device tests required under E.12. and retain each record for 3 years after it is made.

I. Records of training and certification. Each licensee and registrant shall maintain the following clear and legible records of training and certification for 3 years after the record is made:

(1) Records of training of each radiographer, radiographer trainer, and radiographer trainee. The record must include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations, as required in E.16.D., and names of individuals conducting and receiving the oral and practical examinations. A copy of the trainee status card will satisfy the documentation requirements of E.16.A. and a certification ID card will satisfy the documentation requirements of E.16.B; and

(2) Records of annual refresher safety training and semiannual audits of job performance for each radiographer and each radiographer's trainee. The records must list the topics discussed during the refresher safety training, the dates the annual refresher safety training was conducted, and names of the instructors and attendees. For audits of job performance, the records must also include a list showing the items checked and any non-compliances observed by the RSO.

J. Copies of operating procedures, emergency procedures, and internal audit requirements.

(1) Each licensee and registrant shall maintain a copy of current operating and emergency procedures until the Agency terminates the license or certificate of registration. Superseded material must be retained for 3 years after the change is made.

(2) Records of the internal audit requirements for the use of radiation machines and the use of sealed sources shall be retained for 3 years from the date of the audit.

K. Records of personnel monitoring procedures. Each licensee and registrant shall maintain the following exposure records specified in E.19.:

(1) Direct reading dosimeter or electronic personal dosimeter readings and yearly operability checks for 3 years after the record is made.

(2) Records of alarm ratemeter calibrations for 3 years after the record is made.

(3) Reports received from the individual monitoring device processor until the Agency terminates the license or certificate of registration.

(4) Records of estimates of exposure as a result of off-scale personal direct reading dosimeters, or lost or damaged individual monitoring devices, until the Agency terminates the license or certificate of registration.

L. Records of radiation surveys. Each licensee and registrant shall maintain a record of surveys required in E.19. and E. 25.E. for 3 years after it is made.

M. Form of records. Each record required by this Part must be legible throughout the specified retention period. The record may be the original or a reproduced copy or a microfilm provided that the copy or microfilm is authenticated by the authorized personnel and that the microfilm is capable of reproducing a clear copy throughout the required period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials, and signatures. The licensee or registrant shall maintain adequate safeguards against tampering with and loss of records.

N. Location of documents and records**.**

(1) Each licensee and registrant shall maintain copies of records required by this Part and other applicable Parts of these regulations.

(2) Each licensee and registrant shall also maintain copies of the following documents and records sufficient to demonstrate compliance at each applicable field station;

(a) The license or certificate of registration authorizing the use of sources of radiation;

(b) A copy of Parts D, E, and J of the Agency regulations;

(c) Utilization records for each radiographic exposure device or radiation machine dispatched from that location.

(d) Records of equipment problems identified in daily checks of equipment,

(e) Records of alarm system and entrance control checks, if applicable;

(f) Records of direct reading dosimeters such as pocket dosimeter and/or electronic personal dosimeter readings, if applicable;

(g) Operating and emergency procedures*;*

(h) Evidence of the latest calibration of the radiation survey instruments in use at the site*;*

(i) Evidence of the latest calibrations of alarm rate meters and operability checks of pocket dosimeters and/or electronic personal dosimeters*;*

(j) Latest radiation survey records;

(k) The shipping papers for the transportation of radioactive materials ; and

(l) When operating under reciprocity; a copy of the NRC, Agreement State, or Licensing State License or certificate of registration authorizing the use of sources of radiation.

REPORTING

27. Reporting Requirements.

A. In addition to the reporting requirements specified under other sections of this Part and other applicable Parts of these regulations, each licensee shall provide a written report to the Agency; Department of Human Services, Division of Health Engineering, Radiation Control Program, #10 State House Station, Augusta, Maine 04333, within 30 days of the occurrence of any of the following incidents involving radiographic equipment:

(1) Unintentional disconnection of the source assembly from the control cable.

(2) Inability to retract the source assembly to its fully shielded position and secure it in this position.

(3) Failure of any component (critical to safe operation of the device) to properly perform its intended function.

(4) An indicator on a radiation machine fails to show that radiation is being produced;

(5) An exposure switch on a radiation machine fails to terminate production of radiation when turned to the off position; or

(6) A safety interlock fails to terminate x-ray production.

B. The licensee or registrant shall include the following information in each report submitted under paragraph E.27.A.

(1) A description of the equipment problem.

(2) Cause of each incident, if known.

(3) Manufacturer and model and serial number of equipment involved in the incident.

(4) Place, time, and date of the incident

(5) Actions taken to establish normal operations.

(6) Corrective actions taken or planned to prevent recurrence.

(7) Names and qualifications of personnel involved in the incident.

C. Reports of overexposures submitted under Part D that involve failure of safety components of radiography equipment must also include the information specified in E.27.B.

28. Records Required at Temporary Job Sites. Each licensee or registrant conducting industrial radiography at a temporary site shall have the following records available at that site for inspection by the Agency:

A. Appropriate license or certificate of registration authorizing the use of sources of radiation;

B. Operating and emergency procedures;

C. Applicable regulations;

D. Survey records required pursuant to E.19, E.20, and/or E.25.E for the period of operation at the site;

E. Daily pocket dosimeter records for the period of operation at the site; and

F. The utilization records for each radiographic exposure device and/or radiation machine dispatched from that location in accordance with this Part; and

G. The latest instrument calibration and leak test record for specific devices in use at the site. Acceptable records include tags or labels that are affixed to the device or survey meter.

29. Specific Requirements for Radiographic Personnel Performing Industrial Radiography.

A. At a job site, the following shall be supplied by the licensee or registrant:

(1) At least one operable, calibrated survey instrument for each exposure device or radiation machine in use;

(2) An individual monitoring device for each individual;

(3) An operable, calibrated pocket dosimeter or electronic personal dosimeter with a range of zero to 200 milliroentgens for each worker; and

(4) An operable, calibrated alarm ratemeter for each worker as specified in E.18.

(5) the appropriate barrier ropes and signs.

B. Each radiographer at a job site shall carry a valid certification ID card issued by the Agency or another certifying entity whose certification offers the same or comparable certification standards.

C Each radiographer trainee at a job site shall carry a trainee status card issued by the Agency or equivalent documentation in accordance with E.16.A.

D Radiographic personnel shall not perform radiographic operations if any of the items in E.29.A.-C. are not available at the job site or are inoperable. Radiographic personnel shall ensure that the items listed in E.29.A., radiographic exposure devices, and radiation machines are used in accordance with the requirements of this Part.

E. Each licensee or registrant shall provide as a minimum two person crews when sources of radiation are used at temporary job sites.

F. No individual other than a radiographer or a radiographer trainee who is under the personal supervision of a radiographer trainer shall manipulate controls or operate equipment used in industrial radiographic operations.

G During an inspection by the Agency, the Agency inspector may terminate an operation if any of the items in E.29.A.-C. are not available and operable or if the required number of radiographic personnel are not present. Operations shall not be resumed until such conditions are met.

30. Special Requirements and Exemptions for Radiation Machines in Enclosed Radiography.

A. Systems for enclosed radiography, including shielded-room radiography and cabinet x-ray systems not otherwise exempted, designed to allow admittance of individuals shall:

(1) Comply with all applicable requirements of this Part and D.6 of these regulations. If such a system is a certified cabinet x-ray system, it shall comply with all applicable requirements of this Part, Part H and 21 CFR 1020.40.

(2) Be evaluated at intervals not to exceed 1 year to assure compliance with the applicable requirements as specified in E.24. Records of these evaluations shall be maintained for inspection by the Agency for a period of 2 years after the evaluation.

B. Certified and uncertified cabinet x-ray systems designed to exclude individuals are exempt from the requirements of this Part except that:

(1) Operating personnel must be provided with an individual monitoring device and reports of the results must be maintained for inspection by the Agency.

(2) No registrant shall permit any individual to operate a cabinet x-ray system until such individual has received a copy of and instruction in the operating procedures for the unit and has demonstrated competence in its use. Records, which demonstrate compliance with this section shall be maintained for inspection by the Agency until disposition is authorized by the Agency.

(3) Tests for proper operation of high radiation area control devices, interlocks, or alarm systems, where applicable, must be conducted and recorded in accordance with E.25.

(4) The registrant shall perform an evaluation, at intervals not to exceed 1 year, to determine conformance with D.6 of these regulations. If such a system is a certified cabinet x-ray system, it shall be evaluated at intervals not to exceed 1 year to determine conformance with 21 CFR 1020.40. Records of these evaluations shall be maintained for inspection by the Agency for a period of 2 years after the evaluation.

C. Certified cabinet x-ray systems shall be maintained in compliance with 21 CFR 1020.40 unless prior approval has been granted by the Agency pursuant to A.3.(a) of these regulations.

31. Prohibitions.

A. Industrial radiography performed with a sealed source that is not fastened to or contained in a radiographic exposure device (fish pole technique) is prohibited unless specifically authorized in a license issued by the Agency.

B. Retrieval of disconnected sources or sources that cannot be returned by normal means to a fully shielded position or automatically secured in the radiographic exposure device, shall not be performed unless specifically authorized by a license condition.

32. Periodic Survey.

A. Industrial radiography operations using radioactive materials shall be inspected at least annually.

B. Industrial radiography operations using x-ray shall be inspected prior to January 1, 1987, and once every two years thereafter.

C. Upon notification or discovery of a violation to the rules stated in this section, the Department may, in its notice of violation to the licensee, require a re-inspection, by a Qualified Expert or Qualified Individual pursuant to the requirements in Part H. This increase in frequency of inspection will depend upon the severity of the violation.

33. Radiographer Examination and Certification.

A. Application and fee for radiographer certification examinations.

(1) Application.

(a) An application for taking the examination shall be on forms prescribed and furnished by the Agency.

(b) The non-refundable application fee for examination shall be determined by the Agency.

(c) The appropriate fee shall be submitted with the application for examination when filing with the Agency.

(d) The application and any non-refundable fee, shall be submitted to the Agency on or before the dates specified by the Agency.

(2) Examination. The examination shall be given for the purpose of determining the qualifications of applicants.

(a) The scope of the examination and the methods of procedure, including determination of the passing score, shall be prescribed by the Agency. The examination will assess the applicant's knowledge to safely use sources of radiation and related equipment and the applicant's knowledge of these regulations, Parts A, B, C, D, E, J, & L.

(b) The examination will be administered by the Agency or persons authorized by the Agency.

(c) A candidate failing an examination may apply for re-examination in accordance with E.33.A. and will be re-examined. A candidate shall not retake the same version of the Agency-administered examination.

(d) The examination shall be offered at various times throughout the year. Times, dates, and locations of the examination will be furnished by the Agency.

(e) The examination will be in the English language.

(f) To take the examination, an individual shall present a photo identification card, such as a driver's license, at the time of the examination.

(g) Calculators will be permitted during the examination. However, calculators or computers with preprogrammed data or formulas, including exposure calculators, will not be permitted during the examination.

(h) The examination will be a "closed-book" examination.

(i) Any individual observed by an Agency proctor to be compromising the integrity of the examination shall be required to surrender the examination, the answer sheet, and all scratch paper. Such individual will not be allowed to complete the examination, will forfeit the examination fee, and will leave the examination site to avoid disturbing other examinees. Such individual must wait 90 days before taking a new examination and must resubmit a new application and a non-refundable examination fee, as determined by the Agency.

(j) Examination material shall be returned to the Agency at the end of the examination. No photographic or other copying of examination questions or materials shall be permitted. Disclosure by any individual of the contents of any examination prior to its administration is prohibited.

(k) The names and scores of individuals taking the examination shall be a public record.

B. Radiographer certification.

(1) An application for radiographer certification shall be on a form provided by the Agency.

(2) A certification ID card shall be issued to each individual who successfully completes the requirements of this Part.

(a) Each individual's certification ID card shall contain the individual's photograph. The Agency will take the photograph at the time the examination is administered.

(b) The certification ID card remains the property of the Agency and may be revoked or suspended under the provisions of paragraph (4) of this subsection.

(c) Any individual who needs to replace a certification ID card shall submit to the Agency a written request for a replacement certification ID card, stating the reason a replacement certification ID card is needed. A non-refundable fee determined by the Agency shall be paid to the Agency for each replacement of a certification ID card. The prescribed fee shall be submitted with the written request for a replacement certification ID card. The individual shall carry a copy of the request while performing industrial radiographic operations until a replacement certification ID card is received from the Agency.

(d) Each certification ID card is valid for a period of five years and is the property of the State, unless revoked or suspended in accordance with paragraph (4) of this section. Each certification ID card expires at the end of the day, in the month and year stated on the certification ID card.

(3) Renewal of a radiographer certification.

(a) Applications for examination to renew a radiographer certification shall be filed in accordance with (1) of this section.

(b) The examination for renewal of a radiographer certification shall be administered in accordance with (2) of this section.

(c) A renewal certification ID card shall be issued in accordance with (2) of this section.

(4) Suspension or revocation of a radiographer certification.

(a) Any radiographer who violates the requirements of this Part, or provides any material false statement in the application or any statement of fact required in accordance with this Part, may be required to show cause at a formal hearing why the radiographer certification should not be suspended or revoked in accordance with Part B.

(b) When an Agency order has been issued for an industrial radiographer to cease and desist from the use of sources of radiation or the Agency suspends or revokes the individual's radiographer certification, the radiographer shall surrender the certification ID card to the Agency until the order is changed or the suspension expires.

(c) An individual whose radiographer certification has been suspended or revoked by the Agency or another certifying entity shall obtain written approval from the Agency to apply to take the examination.

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APPENDIX A

SUBJECTS TO BE COVERED DURING THE INSTRUCTION OF RADIOGRAPHER TRAINEES

I. Fundamentals of Radiation Safety

A. Characteristics of radiation
B. Units of radiation dose in rems (sieverts) and quantity of radioactivity in curies (becquerels).
C. Significance of radiation dose
   1. Radiation protection standards;
   2. Biological effects of radiation;
   3. Hazards of exposure to radiation; and
   4. Case histories of radiography accidents.

D. Levels of radiation from sources of radiation; and
E. Methods of controlling radiation dose
   1. Working time
   2. Working distances; and
   3. Shielding

II. Radiation Detection Instrumentation to include the following:

A. Use of radiation survey instruments
   1. Operation
   2. Calibration
   3. Limitations

B. Survey techniques; and
C. Use of individual monitoring devices to include as a minimum:

   1. Film badges
   2. Thermoluminescent dosimeters
   3. OSL's
   4. Pocket dosimeters
   5. Alarming rate meters; and
   6. Electronic personal dosimeters

III. Radiographic Equipment to Be Used

A. Remote handling equipment;
B. Operation and control of radiographic exposure devices and sealed sources, including pictures or models of source assemblies (also known as pigtails);
C. Storage and transport containers, source changers;
D. Operation and control of x-ray equipment;
E. Collimators;
F. Storage, control, and disposal of radioactive materials; and
G. Inspection and maintenance of equipment.

IV. The Requirements of Pertinent Federal and State Regulations

V. The Licensee's or Registrant's Written Operating and Emergency Procedures

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APPENDIX B

Items to be Covered During the Inspection of Radiographic Equipment

I. Radiographic exposure devices shall be inspected for:

A. Abnormal surface radiation levels anywhere on camera, collimator, or guide tube;
B. Condition of safety plugs;
C. Proper operation of locking mechanism;
D. Condition of the pigtail connector;
E. Condition of the carrying device (straps, handle, etc.); and
F. Proper handling and legible labeling.

II. Guide tubes shall be inspected for:

A. Rust, dirt, or sludge buildup inside the guide tube;
B. Condition of the guide tube connector;
C. Condition of the source stop;
D. Kinks or damage that could prevent proper operation; and
E. Presence of radioactive contamination.

III. Control cables and control drive mechanisms shall be inspected for:

A. Proper control drive mechanism with camera, as appropriate;
B. Changes in general operating characteristics;
C. Condition of connector on drive cable;
D. Drive cable flexibility, wear, and rust;
E. Excessive wear or damage to control drive mechanism parts;
F. Damage to drive cable conduit that could prevent the cable from moving freely;
G. Proper connector mating between the drive cable and the pigtail;
H. Proper operation of source position indicator, if applicable; and
I. Presence of radioactive contamination.

IV. Pipeliners shall be inspected for:

A. Abnormal surface radiation;
B. Changes in the general operating characteristics of the unit;
C. Proper operation of shutter mechanism;
D. Chafing or binding of shutter mechanism;
E. Damage to the device that might impair its operation;
F. Proper operation of locking mechanism;
G. Proper drive mechanism with camera, as appropriate;
H. Condition of carrying device (strap, handle, etc.); and
I. Proper and legible labeling.

V. X-ray equipment shall be inspected for:

A. Change in the general operating characteristics of the unit;
B. Wear of electrical cables and connectors;
C. Proper and legible labeling of console;
D. Proper console with machine, as appropriate;
E. Proper operation of locking mechanism;
F. Proper operation of timer run-down cutoff; and
G. Damage to tube head housing that might result in excessive radiation levels.

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APPENDIX C

Items to be Included in Operating and Emergency Procedures:

A. Handling and use of sources of radiation for industrial radiography such that no individual is likely to be exposed to radiation doses that exceed the limits established in Part D;

B. Methods and occasions for conducting radiation surveys, including lock-out survey requirements;

C. Methods for controlling access to industrial radiography areas;

D. Methods and occasions for locking and securing sources of radiation;

E. Personnel monitoring and the use of personnel monitoring equipment, including steps to be taken immediately by industrial radiographic personnel in the event a pocket dosimeter is found to be off-scale (see E.18.);

F. Methods of transporting equipment to field locations, including packing of sources of radiation in the vehicles, placarding of vehicles, and controlling of sources of radiation during transportation (including applicable DOT requirements);

G. Methods or procedures for minimizing exposure of individuals in the event of an accident, including procedures for a disconnect accident, a transportation accident, and loss of a sealed source;

H. Procedures for notifying proper personnel in the event of an accident;

I. Specific posting requirements;

J. Maintenance of records (see E.26.);

K. Inspection, maintenance, and operational checks of radiographic exposure devices, source changers, storage containers, transport containers, source guide tubes, crank-out devices, and radiation machines;

L. Method of testing and training in accordance with sections E.16. and E.33.;

M. Source recovery procedures if the licensee is authorized to perform source recovery; and

N. The procedure(s) for identifying and reporting defects and noncompliance, as required by E.27 and 10 CFR Part 21, if applicable.